CS05

Phase Coexsitance in Polycrystalline and Epitaxial in $Nd_{0.5}Sr_{0.5}MnO_3$ Films

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100 nm thick $Nd_{0.5}Sr_{0.5}MnO_3$ (NSMO) thin films are deposited on single crystal $LaAlO_3$ (LAO/(001)) and ZrO_2 (ZO/(001)) substrates by on axis DC magnetron sputtering. The films on LAO are epitaxial, while those on ZrO_2 are polycrystalline. Multiple magnetic transtions (Fig. 1) caused by the competing FM, AFM and CO phases that are present in the vicinity of x~0.50 are observed in both set of films. The first one is PM-FM transition, occurs at T_C~230 and 260 K in case of the epitaxial and polycrystalline films respectively. The AFM-CO transition occurs at T_{CO}~160 K in both films on LAO and ZrO_2 (Fig. 1). Due to in-plane compressive strain the CO (T_{CO}=160 K) is weaker in the film on LAO. In the polycrystalline film T_{CO}~120 K is slightly lower. The second ferromagnetic transition is observed just below T~150 K in the epitaxial film due supperation of long range CO phase. Concomitant with the CO, AFM transition is observed in the polycrystalline film. The epitaxial film exhibits metal-insulator (IM) transitions at T_{IM}~230 K. The polycrystalline film has IM transition at T_{IM}~140 K. The lower T_{IM} in the polycrystalline film is due to the presence of grain boundaries in the polycrystalline film. The epitaxial film exhibits the typical CMR effect (MR~90% at H=7T) in the vicinity of T_C/T_{IM} and a second MR peak corresponding the third magnetic transition is also observed at T~100 K. The polycrystalline thin film shows significant MR that has epitaxial as well as polycrystalline contribution. The lectrical transport of these films have also been analysed in frame of small polaron and variable range hopping models.

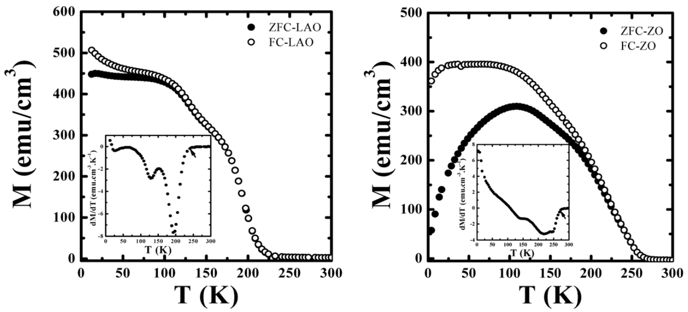

Fig. 1. M-T plots of epitaxial (left) and polycrystalline (right) NSMO thin films.

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Electro-less Deposited Ni-Co-P Nanolayer on Plate-like Particles and Their Magnetic Properties with the Operation of Composition Rate

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Formation of a Ni-Co-P nanolayer on plate-like particles through the electro-less plating route and its related magnetic properties were discussed. Ni-Co-P nanolayer particles with the thickness from several tens to hundreds nanometer size and 30-70% cobalt content were formed by controlling pH and reaction time in a phosphinate electo-less plating bath. The morphology, crystal structure and electromagnetic properties of the Ni-Co-P nanolayer particles were analyzed with field emission scanning electron microscopy (FE-SEM), X-ray diffraction (XRD), vibration sample magnetometer (VSM) and vector network analyzer (VNA). The result shows that the deposition depth and crystallinity of Ni-Co-P nanolayer depend on plating time and annealing temperature. An annealed Ni-Co-P nanolayer at 400-700ºC was well-crystallized cubic phase, while as-deposited Ni-Co-P nanolayer by electro-less plating was amorphous phase. It was confirmed that the plating parameter and crystallinity significantly influenced on their magnetic properties such as saturation magnetization and frequency dependency of permeability. The high power loss was observed in a frequency range of 20 M~1 GHz due to controlling deposition depth, crystallinity, and Ni/Co ratio of Ni-Co-P nanolayer.

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